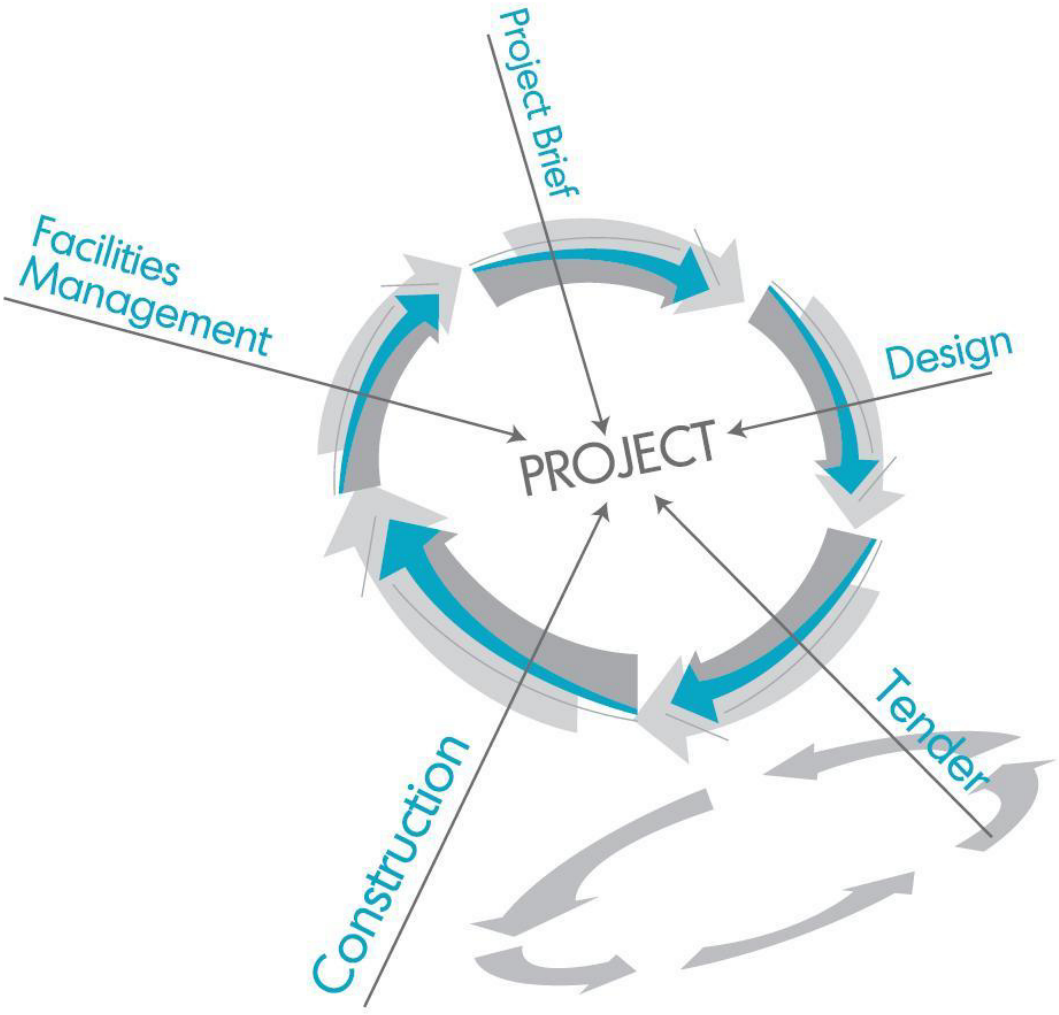
MCRJ Volume 16 | No.1 | 2015

ISSN 1985 - 3807

Malaysian Construction Research Journal



CREAM
Construction Research Institute of Malaysia

CIDB MALAYSIA

MALAYSIAN CONSTRUCTION RESEARCH JOURNAL (MCRJ)

Volume 16 | No.1 | 2015

The Malaysian Construction Research Journal is indexed in
Scopus Elsevier

ISSN No.: 1985 - 3807

Construction Research Institute of Malaysia (CREAM)
MAKMAL KERJA RAYA MALAYSIA
CIDB Wilayah Persekutuan, 1st Floor, Block E, Lot 8
Jalan Chan Sow Lin,
55200 Kuala Lumpur
MALAYSIA

Contents

Editorial Advisory Board ii

Editorial iv

IMPULSE RESPONSE ANALYSIS FOR MALAYSIAN CONSTRUCTION SECTOR BY VECTOR ERROR CORRECTION MODEL 1
Raza Ali Khan, Mohd. Shahir Liew and Noor Amila Wan Abdullah Zawawi

AN EXPLORATORY STUDY ON ENABLERS AND BARRIERS FOR ONSITE MECHANISATION IN THE MALAYSIAN CONSTRUCTION INDUSTRY 15
M. Waris, M. Shahir Liew, M. Faris and Arazi Idrus

BUSINESS VALUE OF BIM IN MALAYSIA'S AEC INDUSTRY: PRELIMINARY FINDINGS 31
Mohd. Harris, Elias Ismail and Afifudin Husairi Hussain

WOMEN'S CONSULTANT PARTICIPATION IN THE MALAYSIAN CONSTRUCTION INDUSTRY 43
Mastura Jaafar, Azlan Raofuddin Hj Nuruddin and Norliza Mazlan

UNLEASHING THE POTENTIAL OF TRADITIONAL CONSTRUCTION TECHNIQUE IN THE DEVELOPMENT OF MODERN URBAN MASS HOUSING 59
Gan Hock Beng, Zuhairi Abd. Hamid and Foo Chee Hung

REVIEW OF CARBON EMISSION AND LCA APPLICATION TOWARDS SUSTAINABLE BUILDING 77
Murnira Othman, Ahmad Fariz Mohamed and Mahira Othman

Editorial Advisory Board

Editorial

Welcome from the Editors

Welcome to the sixteenth issue of Malaysian Construction Research Journal (MCRJ). In this issue, we are pleased to include another six papers that cover wide range of research area in construction industry. The editorial team would like to express our sincere gratitude to all contributing authors and reviewers for their contributions, continuous support and comments. It is hope that readers will find informative articles from this edition of MCRJ. In this issue;

Raza Ali Khan, *et. al.* present an empirical examination of Malaysian Construction Sector (MCS), through the development of a time series model equation under vector error correction (VEC) system. The estimated model is able to develop the impulse response functions (IRFs) for the purpose of examining the behavior and response of MCS against the positive shocks produced in other major sectors of the economy and vice versa. The results suggest that the MCS is relatively small in size and contribution to GDP; however, it has strong correlation and long and short run association with all major sectors of the economy.

M. Waris, *et. al.*, through questionnaire survey, investigates the current awareness of onsite mechanisation, the advantages in its adoption, and the barriers for onsite mechanisation application in Malaysian construction industry. The paper reveals that there is a good understanding and application of mechanised practices among IBS contractors. However, for medium and small size contractors, the implementation of onsite mechanisation is largely inhibited due to budget constraints as it is considered an extra financial burden.

Mohd. Harris, *et.al.* explore the expectation of the stakeholders over the potential business value of Building Information Modelling (BIM) in the Architecture, Engineering, and Construction (AEC) industry through quantitative analysis. Despite of being reluctant to take up BIM into their process delivery, the professional personnel within the AEC industry are aware of the benefits and Return on Investment (ROI) gained from the BIM investment. The study proposed in-depth research with empirical study over ROI for BIM projects and the strategies for technological competencies development for a BIM user should be conducted.

Mastura Jaafar, *et. al.* study the level of women participation in the construction industry. The findings bring an important message to the industry, by identifying the barriers and challenges faced by women in this sector. It was found that the main barriers that caused low women participation in construction industry are due to inflexible working hours, mistreatment by others in the industry, and the strict recruitment processes.

Gan Hock Beng, *et. al.* propose a new housing design strategy enables retrofit and reconfiguration to be made quickly, economically, and repeatedly, without involving excessive site labour, time, and cost; as compared to the currently adopted one which is associated with rigid structure, interlocking plan, and predetermined function. By comparing these two design strategies, they authors demonstrate the potential of applying flexibility as an inherent design strategy for the modern urban mass housing. The paper, hence, suggests that only dwellings with high degree of flexibility may enable the integration of dual aims and principles of

affordability and sustainability in mass housing, thereby facilitating the movement of the country's construction industry towards mechanisation, industrialisation, and standardisation.

Murnira Othman, *et. al.* provide an overview of construction activities in Malaysia and review the importance of applying Life Cycle Assessment (LCA) in building construction. Wide application of LCA in various types of building as well as among many countries suggests that this tool is important in evaluating building performance. The paper also suggests that the implementation and application of LCA in the building sector is a wise move towards energy saving, emission reduction, and natural resource conservation.

Editorial Committee

WOMEN'S CONSULTANT PARTICIPATION IN THE MALAYSIAN CONSTRUCTION INDUSTRY

Mastura Jaafar, Azlan Raofuddin Hj Nuruddin and Norliza Mazlan
Department of Quantity Surveying, School of Housing Building and Planning, Universiti Sains Malaysia, 11800, Pulau Pinang.

Abstract
It has been over a decade that the number of women entering construction related programmes in Malaysian higher education has outnumbered men. However their numbers of involvement in the industry is very much lower compared to men and has not been extensively documented. The aim of this paper is to establish the level of women's participation in the construction industry and to identify the barriers and challenges faced by women in this sector. A questionnaire survey has been administered to 45 women working in consultancy firms in the construction industry through simple random sampling. Majority of the respondents were in the category of having 1-10 years of industry experience. Their decision to enter the industry has been influenced either by parents, themselves or friends and motivated by financial gains and good career opportunities. The main barrier to remain in the construction industry is the inflexible working hours and the most challenging factors faced are mistreatment by others in the industry and strict recruitment processes. The findings bring an important message to the consultant organizations, to continue their support on this cohort, especially those with family obligations, by developing flexible work schedules and looking at cases of mistreatment seriously. In anticipation of the industry recruiting higher number of women workers in the future, it is thus timely that the industry should formally acknowledge their existence and contribution. Adopting flexible working arrangements would greatly facilitate in the development and enhancement of this potentially important asset to sustain in the industry.

Keywords: *Barriers; Challenges; Women's participation; Construction industry and Malaysia*

INTRODUCTION

In reality, female representation in the workplace has increased enormously during recent decades in most developed countries; furthermore, women have begun to enter traditionally male-dominated jobs owing to economic reasons and organizational changes in worksite settings (Lin et al., 2011). In the US, women make up approximately one half of the US workforce (U.S. Department of Labor, 2011). Female employment rates in the UK are "*inching closer to men's employment rates all the time"* (Li et al., 2008). Malaysia, on the other hand, was reported to have the lowest women labor participation rate in East Asia (Labor Force and Social Trends in Asean, 2008). Compared to the neighbouring Asean countries, Malaysian women participation stood at 40% compared to Indonesia and Philippines (52%) and Singapore (60%).

The construction industry is one of the most male-dominated industries in the world, with a male representation rate of more than 90% (Fielden et al., 2010). Although the opportunities for women in the construction industry appear to be increasing, these are still extremely limited (Fielden et al., 2010). According to the Construction Industry Training Board (CITB, 2003), women only account for 9% of the construction work force. Women are confronted by a significant number of barriers, including difficulties in joining the construction industry and gaining the most senior positions in the organization's hierarchy; there are growing interests for women in the industry to better negotiate and define their professional identities (Powell et al., 2006).

In Malaysia, although the participation of women in the academic side of the construction sector is still low, the percentage has increased from 30% in 2001 to 33% in 2005 (Eaton and Morton, 2008). It is also predicted that the percentage will increase by the year 2020. The higher enrolment of women compared to men in public universities in Malaysia over the past decades may lead to the future phenomena where a construction project handled 100% by women becomes a reality (Department of Statistics Malaysia, 2013). Based on the Department of Statistics Malaysia (2013), the rate of female employment population has increased to 47.9% in 2011 compared with 30.8% in 1957 (Peninsular Malaysia). These figures show the ever increasing female employment population in the construction industry in Malaysia, even though it is still lower than that of the male population (Sihi, 2012).

There are some barriers that prevent women from participating in the construction industry, the biggest being those related to entry, development and retention (Amaratunga et al., 2006). Moreover, women also encounter physical barriers, such as on-site environmental hurdles and perceived emotional support barriers that can even lead to hostility from colleagues or from the environment (Geertsema 2007). In Malaysia, safety and health problems in the construction industry create further barriers to women entering and remaining in this field (Sarkar 2002). The working environment is generally not conducive to the sustained employment of wives and mothers. The Occupational Safety and Health Administration (OSHA) (1999) found that, in a one year period, 41% of female construction workers suffered from gender harassment and 88% reported sexual harassment.

Previous studies on women's participation in the construction industry have focused on barriers that prevented women from achieving managerial-level positions (e.g., Ginige et al., 2007; Greed, 2000) and have all been conducted in Western countries (e.g., Gale, 1994; Sommerville et al., 1993). Furthermore, according to Fielden et al. (2010), the construction industry itself has not, until recently, formally acknowledged that the under-representation of women is an important issue. Besides construction organizations, studies on women in the construction industry have been covered on women consultants such as Lingard and Lin (2004), Loosemore and Galea (2007) and Enshassi et al., (2008). There is an obvious lack of study conducted covering professional women's participation in the construction industry, such as quantity surveyors, engineers, architects and project managers, especially in Malaysia. Focusing on professional women in the industry, this study thus aims to establish the level of women's participation in the construction industry and identify the barriers and challenges encountered by them.

The next section contains a review of literature related to women in the construction industry. The literature review is followed by a description of the research methodology with the research findings reported in the next section. The discussion section reports the findings on participation, barriers and challenges met by professional women in the industry. Finally, the conclusion identifies implications of the findings and contributions of the research.

LITERATURE REVIEW

Women in the construction industry

The issue of women's underrepresentation in the construction industry has been of great concern since the early 1980's. Women in this industry are perceived as the wrong gender to be in construction occupations that require manual dexterity and physical strength (Aulin and Jingmond 2005). A recent survey of 81 female construction workers by the Ucatt Union in the UK found that 41 (51%) believed that they were treated unfairly at work because of their gender and 34 (42%) reported that bullying and harassment by managers was a problem (The Construction Index, 2012).

According to the National Women's Law Center (NWLC, 2012), the construction industry generally employs less than 10% of female in the workforce with even lower participation in specific crafts and trades. Many of the European Union countries today are suffering shortages in skilled labor, but project-based companies are more interested in seeking external resources, such as immigrant workforces, instead of looking at local resources (i.e., female workforce) to cover the increasing demand (Clarke et al., 2005). In relation to this, women need to be aware that the industry does not guarantee high-paying jobs with benefits (Bakar, 2012). Enshassi et al., (2008) argued that women would rather choose a 'softer' option for their career paths rather than gain employment in the construction industry with the frequency of relocations to new construction sites and working long hours.

Barriers against women's entry to the construction industry

Image of the industry

The construction industry is typically portrayed as promoting adversarial business relationships, poor working practices and environmental insensitivity, and has a reputation for under performance (CITB, 2003). The predominant industry image is one that is male-dominated, requiring brute strength and a good tolerance for outdoor conditions, inclement weather and foul languages.

One assumption on which some arguments are based states that a woman is physically not strong enough to endure the strenuous tasks involved. In fact, when entering gender-segregated occupations, women must prove their competence, despite their qualifications and experiences (Clarke et al., 2005). Dainty et al. (2000) found that women may not remain in the industry after completing a related degree due to the incorrect picture of the industry portrayed by recent recruitment initiatives.

Culture and environment

Women often choose a career in the construction industry if the work environment is challenging, provides good working conditions and fosters a sense of responsibility (Geertsema, 2007). Most women who join the construction industry are willing to take on certain challenges and are motivated to adapt to the environment, and by taking on construction roles, such as

being an environmental consultant, while seen as a greater good, is still dependent upon an individual's decision (Williams, 2013).

The construction industry has a macho culture where relationships are characterized by argument, conflict and crisis (Gale, 1994). Consequently, employees (male and female) find that they are exposed to an extremely hostile environment. In the UK, the construction workplace has been described as amongst the most chauvinistic, with an extremely macho culture that is hostile and discriminatory towards women (Bagilhole et al., 2002), resulting in gender-differentiated career opportunities, leading to the inevitable consequence of high staff turnover of women in construction companies (Amaratunga et al., 2008).

According to Michael Romans, past president of the Chartered Institute of Building, the construction industry is characterized by *"a boy's own culture,"* which is overtly fostered on language and behavior (Amaratunga et al., 2006, p.564). Davey et al. (2005) highlighted that male values are the norm in the construction industry. These include long working hours, competition, independence, full-time work and high expectations for rewards and career advancement. Invariably, such male-dominant culture can be especially destructive for women's entry to the industry and their subsequent career development and retention.

Health and safety

A hostile workplace presents health and safety concerns on several levels, ranging from a lack of training and safety information to physical assault (Occupational Safety and Health Administration [OSHA], 1999). Distractions while working can lead to the improper practice of precautions that, in turn, lead to on-site injuries. The effects of a hostile workplace can be reflected in acute and chronic stress reactions (OSHA, 1999). According to a survey conducted by OSHA (1999) on women in the industry, 41% responded that they had been mistreated by co-workers or supervisors because they were female. The findings also showed that harassment by co-workers or supervisors served as an important predictor for symptoms of increased psychological and physiological distress (Bennett et al., 1999). In an industry already fraught with obvious dangers, this serves only to exacerbate the problems of female workers.

Sexual harassment

Sexual harassment is a serious problem for female construction workers. According to a 1996 USA Today analysis of the U.S. Equal Employment Opportunity Commission and Bureau of Labor Statistics data, female construction workers had the second highest rate of sexual harassment complaints per 100,000 employed women. Sexual harassment violates laws prohibiting sex discrimination in employment (Lan, 2011). There is growing evidence that sexual harassment, at a minimum, is a stress inducer that, in its more extreme forms, can pose a danger as a result of distraction, fear and assault (Shukor, 2012).

Marital status

It is hypothesized that women do not reach the top echelons in the construction industry management structure because their active careers are shorter than those of men due to family obligations and motherhood, as well as the lack of education and skills (Baksh, 2012). A declining number of women resign from their work for reasons related to marriage and or children. For those who choose to leave, a majority returned when the children were already of school-going age (Aziz and Marrison, 2001).

Women, being child bearers, have to address issues of initially caring for a baby, and the requirement to take leave from work. In fact, Harriet stated that "*One of the barriers in employing women is the assumption by society and industry that they will leave and have children*" (Harriet, 1999, p.70). For some women however, this is not necessarily true. By choice, some women can decide not to have children or may be physiologically unable to do so (Kellerman and Rhode, 2007). Sometimes, employers are reluctant to employ women who have babies; this phenomenon is not particular only in the construction industry but also in other industries (Kenya-SDN, 2010). Factors such as returning to work, maternity leave, long hours, and confidence are all part of the mix, which makes this a troublesome area (Wilson, 2012).

Level of Education

Women are more likely to face more complex career choices than men. Their career patterns tend to move through phases when other aspects of life take priority. According to Srivastava (1996), there is a large pool of women employees who lack the necessary qualifications in the construction industry because they have opted out so early in their lives.

Glover and Fielding (1997) reported that although the percentage of women with degrees in science, engineering and technology has doubled in the last 15 years, the proportion that used their qualifications professionally has not increased. A feminist theory and its critique of science offer insights as to how scientific investigations and practices within the scientific community, discriminate against females; discrimination, therefore, obstructs female representation in the construction field (Bennett et al., 1999).

The average percentage of females studying degrees related to the construction industry in South Africa is still low compared with that of their male counterparts (Hatipkarasulu and Roff, 2011). If women do not further their education in the construction industry, hence unable to acquire technical expertise and mechanical competence, would consequently result in their lack of technical ability or other means by which to advance their careers (Harriet, 1999).

Challenges faced by women in the construction industry

Compensation

One of the challenges of the construction industry is the issue of financial discrimination. Discrimination in terms of compensation is widespread, and according to Kaganas and Murray's (1994), 1991 census in South Africa showed that less than 10% of women employed

in the construction industry earned over R300,000 annually and 53.6% had smaller incomes of as low as R100 per month or less. Needless to say, these values are far less than those received by male workers. Similarly, Shrum and Geisler (2003) found that women doing the same work as men earned significantly less. A survey of 2,600 construction workers found open inequality in pay, with women earning 10% to 20% less than men for doing similar work (Wells, 2001).

Recruitment

When applying for positions in the industry, many women have reported being subjected to unacceptable comments during interviews (Aziz and Marrison 2001). In a study by Hossain and Kusakabe (2005), the challenges identified by women in the construction industry in Thailand and Bangladesh were all related to the recruitment process.

Patriarchal behavior among colleagues

In striving for self-improvement, it is usual to look for a role model to imitate, and this can be difficult in the construction sector if a woman looks for another female to look up to (Aulin and Jingmond, 2011). The lack of role model, poor career advice, gender-biased recruitment literature, peer pressure and poor educational experiences have all been cited as factors that prevent women's entry to the industry; such factors have an overall effect on the career aspirations and development of women in this field (Dainty et al., 2000).

Promotion and recognition

Restricted promotional opportunities within the organizations occur within divisions that prevent lateral staff mobility among operating divisions, which sustain sub-cultural environments that restricts opportunities for women and maintains existing hierarchy and work practices (Dainty et al., 2000). Women are also considered threats to the limited promotional opportunities available within the organizations (Aulin and Jingmond, 2005).

The promotion of female engineers, for example, has increased considerably in recent decades, from less than 1% to more than 8%. Nevertheless, when they have the same educational qualifications, duration of employment and occupational attitudes, women are less likely than men to achieve high-status positions or move towards a career in management (Lauer, 1995).

RESEARCH METHODOLOGY

Sample and data collection

A sample survey was the type utilized in this research because the time frame only allowed data collection from select participants within a specific period of time (Tan, 2001). In this research, the questionnaire was the sole instrument employed to collect and record data. Simple random sampling method was applied given that each sampling element had an equal chance of being selected. About 250 questionnaires were distributed to various companies by

email. Personal emails were also sent to all women consultant working in the construction industry. Of these, 45 respondents sent back the forms.

The sample size must be 10% of the total population or at least 50 samples in this study (Hoinville and Jowell, 1978). However, in some studies, a minimum of 30 samples is required (Black and Champion, 1998). In this study, 75 female architects were randomly selected from a sampling of 150 architects, 90 female quantity surveyors were randomly selected from a sampling of 120 quantity surveyors, 35 female engineers were randomly selected from a sampling of 80 engineers and 50 project managers were randomly selected from a sampling of 78 project managers. All the personal contact numbers, email addresses and other information from samples were obtained from the list of registered professional consultants in Malaysia.

Based on previous studies (Geertsema, 2007; Hatipkarasulu and Roff, 2011; Bennett and Davidson, 2006), a total of 7 items were used to determine the levels of women's participation in the construction industry; a total of 12 items regarding barriers against women's entry to the construction industry, and 8 items regarding challenges faced by women in the construction industry.

Reliability

Cronbach's alpha is the most common measure of internal consistency or "reliability". It is most commonly used in studies that employ Likert-type scales and multiple questions in a survey/questionnaire. The Cronbach's alpha value of barriers against women's entry to the construction industry is 0.837, while that of the challenges faced by women is 0.876. Kline (1999) noted that cut-off point of 0.7 is more suitable. As a result, none of the main variables are deleted.

ANALYSIS

Demographic data

The majority of the respondents were from 25 to 30 years (42.2%), followed by those under 25 years (39.4%), from 31 to 40 years (31.1%), from 30 to 35 years (17.8%) and 35 years old and above (8.9%). Most of the respondents were single (53.3%); 42.2% were married and only 4.4% were widowed. Majority of the respondents were degree holders (46.7%), followed by graduate/post-graduate degree holders (Master's or PhD), both of which have an equal amount of percentage (26.7%). For the salary range, most of the respondents' salaries are below RM 3,000 (57.8%), while 17.8%, 11.1%, and 13.3%, reported salaries between RM 3,001 to RM 6,000, between RM 6,001 to RM 8,000 and more than RM 8,000, respectively.

Participation of women in the construction industry

For work duration, most of the respondents (57.8%) had work experience of less than 5 years, 17.8% worked for 5 to 10 years, 11.1% worked for 10 to 15 years and 13.3% worked for 15 years or more. This indicated that almost 80% of women who participated in the industry have less than 10 years of experience. According to 31.1% of the respondents, the

main reasons why they chose careers in the construction industry were financial gains and having a good career, with both factors recording the same response rate. This is followed by other factors that included passion or interest (22.2%), peer or parental influence (11.1%) and work environment (4.4%). Most of the respondents chose family as their motivator to enter the construction industry (42.2%), 35.6% made the decision to work in the industry by themselves and 22.2% based their decisions on their friends' inputs.

Since the questionnaires were distributed to all active women in the construction industry, the job titles were different. Thus, 40% of the respondents were quantity surveyors, 20% project managers, 15.6% architects, 13.3% engineers, 6.7% company directors and the rest administrative staff in the construction industry.

Almost all of the respondents (95.6%) answered in the affirmative when asked whether they intended to stay longer in the construction industry, while only 4.4% answered in the negative. For the employment status, 66.7% were permanent employees, 31.3% temporary employees and 2.2% self-employed (they own the company). As for time spent in the office, most of the respondents (48.89%) stayed in the office for more than half of their working days, 26.67% stayed in the office for less than half a day and 24.44% spent equal time at the office and at the construction sites.

Barriers against women's entry to the construction industry

From the descriptive analysis, the major barrier preventing women from entering the construction industry was inflexible working hours (mean=4.02, SD=0.94). This was followed by unsuitable working conditions (m =3.87, SD=0.92), family commitments (m=3.78,SD=0.99), forced to act like men (m=3.69, SD= 1.26), having a baby (m=3.67, SD=0.95), lack of education and practical skills (m=3.64, SD=1.11), presence of macho culture (m=3.64, SD=0.93), male dominance in the industry (m=3.62, SD= 0.93) and mindset (m=3.55, SD=1.12). There are only two factors that elicited neutral or uncertain responses, namely, hostile and discriminatory environment (m=3.47, SD=0.99) and sexual harassment (m=3.33, SD= 3.33).

Table 1. Item Statistics for Barriers against Women's Entry to the Construction Industry

	Mean	Std. Deviation	Ranking No
inflexible working hours	4.0222	0.94120	1
unsuitable working conditions	3.8667	0.91949	2
family commitments	3.7778	0.99747	3
women must act like men	3.6889	1.25811	4
child-bearing responsibility	3.6667	0.95346	5
macho culture	3.6444	0.93312	6
lack of education and practical skills	3.6444	1.11101	6
male-dominated industry	3.6222	0.93636	7
Mindset	3.5556	1.11916	8
hostile and discriminatory	3.4667	0.99087	9
sexual harassment	3.3333	1.18705	10

Scale: >1.49= strongly disagree; 1.5 to 2.49 = disagree; 2.5 to 3.49 = neutral;
3.5 to 4.49 = agree; 4.5 to 5.0 = strongly agree

Challenges faced by women in the construction industry

From the descriptive analysis, the most challenging experience faced by women in the construction industry was being mistreated (mean=3.69, SD= 1.06), followed by strict recruitment (m=3.60, SD=1.13) and underrepresentation and unfairness (m=3.57, SD= 0.94). Meanwhile, their opinions regarding other factors were reflected in the following values: limited promotion opportunity (m=3.46, SD=0.94), inequality (m=3.46, SD=0.99), feeling of vulnerability (m=3.44, SD=1.19), low compensation (m=3.31, SD=1.01) and uncomfortable situation (m=3.27, SD=1.17).

Table 2. Item Statistics for Challenges Faced by Women in the Construction Industry

	Mean	Std. Deviation	Ranking No
mistreatment	3.6889	1.0622	1
strict recruitment	3.6000	1.1361	2
underrepresentation and unfair treatment	3.5778	0.9412	3
inequality	3.4667	0.9908	4
limited promotion opportunities	3.4667	0.9438	4
Vulnerability	3.4444	1.1976	5
low compensation	3.3111	1.0185	6
uncomfortable conditions	3.2667	1.1751	7

Scale: >1.49 = strongly disagree; 1.5 to 2.49 = disagree; 2.5 to 3.49 = neutral;
3.5 to 4.49 = agree; 4.5 to 5.0 = strongly agree

DISCUSSION

The current paper explores women professional consultants in practice in the construction industry of Malaysia. Consultant firms are considered by scholars in construction industry research due to their operational characteristics which almost mirrors conventional construction organizations. These parties need to cooperate in realizing and implementing

projects and their involvement focuses on similar project objectives identified by the client. It is interesting to note that majority of women consultants in the Malaysian construction industry were in the middle age category with less than ten years of experience, and many entered the industry because of financial rewards and the desire for a good career in the industry. Women seemed to be more independent in making decisions regarding their future career. For example, Geertsema (2007) mentioned that people often choose a career in the construction industry if it provides good working conditions, a sense of responsibility and a set of worthwhile challenges. Women also felt that their new found ability to earn money should translate into economic freedom as reflected in their status in society e.g., the ability to buy a house (Enshassi et al., 2008).

Family also plays a significant role in a woman's career. Most respondents said that their involvement is strongly supported by their family, consistent in fact, with a study which found that the family's influence was indeed important for women (Construction Sector Council [CSC], 2010). The study also supported Enshassi et al.'s work (2008) which stated that most women engineers' decision to study civil engineering and architecture was supported by their family, further reinforcing their personal interest to gain employment in the field of construction. Besides that, respondents who were permanent employees indicated their willingness to stay longer in the industry due to their interest, congruent with Enshassi et al.'s findings (2008). They found that majority of women refused to change their opinion regarding their engineering careers, despite the difficulties women engineers may face in construction sites. As for time spent in the office, most of the respondents spent more than 50% of their working hours in the office and the balance on the construction site. Lower hours at site may effectively contribute to the reason why respondents are willing to stay in the industry, as it would be fair assumption for women consultants to prefer to remain in the office, rather than be exposed to the difficult conditions experienced on project sites. This result might be different with women in construction organizations, where their tasks would require more commitment to do on-site work.

Barriers against women's entry to the construction industry

Inflexible working hours is the main barrier preventing women from entering the construction industry. Marriage, and taking on the responsibility as a wife, usually entails bigger responsibility in taking care of a family compared to the husband. Inflexible and long working hours can therefore lead to unproductive and inefficient work outputs for women. The problems increase as the family numbers grow over time, requiring even more time taken for family and leisure pursuits. Raising a family therefore, becomes an overriding priority for some women, and the prospects of long and inflexible working hours become decidedly unattractive. Based on a study by Talent Corp and the Association of Chartered Certified Accountant, in general, Malaysian women strongly desire flexible work arrangements that accommodate family commitments, support, maternal needs, optimum work-life balance and equal opportunities and rewards (New Straits Times, 2013). In the construction industry, women are required to fit into men's culture, but Ginige et al., (2007) argued that as woman is physiologically weaker than man, they may feel more tired and unable to work in the same capacity as her male counterparts.

Unsuitable working conditions form a second barrier against women's entry to the industry. Inadequate information and the lack of education and training concerning workplace health and safety are major concerns among women workers. The culture and attitudes of construction workers, supervisors and companies regarding health and safety often condone risk taking and unsafe work practices, passing "bad" habits from one generation of workers to another. Research conducted in the USA by Robinson and Burnett (2005) to determine the effects of working conditions on the health of women in the construction industry found an elevated mortality percentage for specific cancers and other diseases for women deployed in construction trades.

Family commitment and the responsibility of being a child bearer are other barriers against women's entry to the construction industry. The conflict between work and family obligations experienced by many construction professionals is more acute for women than for men. While men and women both need to balance the demands of work and home life, women still bear the primary responsibility for managing domestic duties in most households (Amaratunga et al., 2008). All of these are related to a woman's child-bearing roles (being pregnant, giving birth, taking care of the children and so on).

The lack of education and practice also serves as another barrier. This is because they are not being exposed to the construction environment and do not have any knowledge of the practical aspects of construction. Parents, teachers and school children believe that jobs in the construction industry are limited to bricklaying, joinery and painting and decorating. School students, undergraduates and graduates also perceive career teachers and careers' advisor as being unable to provide accurate and adequate information on the construction industry (Amaratunga et al., 2008).

The macho culture that prevails in the male-dominated industry also results in the development of a vulnerable mindset among women in the industry. However, in this study, the sense of vulnerability and that of being a victim of discrimination had the lowest response rates. This could be due to the fact that women are able to take care of themselves and exhibit higher levels of confidence. Moreover, women who do enter the construction industry in professional capacities tend to fill technical specialist positions rather than general managerial posts (NWLC, 2012).

Finally, the prospects of relocation and working on shifts can be tenuous for women, especially when required to work long hours and on weekends if a project has to be completed, or if they are required to travel long distances on a daily basis (Baksh, 2012). The construction industry makes extreme demands and expects commitment on time, due to its highly competitive nature. The practice of sequencing has not been proven to work for some women because they often lose their jobs or are replaced.

Challenges faced by women in the construction industry

As mentioned, the major factors faced by women in the industry is mistreatment, followed by strict recruitment, underrepresentation and unfair treatment, limited promotional opportunities, inequality, vulnerability, low compensation and uncomfortable conditions. Women have always been mistreated by male co-workers in the construction industry. Given

that mistreatment is a sign of disrespect, such acts can be considered a form of disregard shown by male colleagues for their female coworkers (United Nation Development Program [UNDP], 2003). That apart, women also face the problem of strict recruitment. As women attempt to achieve a greater degree of equality in career advancement, they may face numerous problems such as the tendency of people to evaluate jobs and careers in terms of gender, educational level, income and position (Baksh, 2012).

Other challenges for women include underrepresentation and unfair treatment. Research indicated that women are offered fewer opportunities to develop and grow compared to men (Amaratunga et al., 2008). Although increasing numbers of women have appropriate educational qualifications, the perception that women are generally unqualified or unsuitable for senior management positions still exists.

Women also suffer from limited promotional opportunities and inequality in the workplace. Women who have been in the industry for a length of time inevitably want to move up the corporate ladder, but most are unable to find enough promotional opportunities (Geertsema, 2007) and receive lower compensation than men. Our respondents had the lowest response rate for this item. However, given their lower qualifications, this can indicate that either qualification dictates compensation or the expectations of our respondents were too high.

CONCLUSION AND RECOMMENDATIONS FOR FUTURE RESEARCH

The construction industry is unique in the Malaysian labor scenario. The statistical data showed that Malaysian women have progressed at a slower rate in the industry while confronting many barriers and challenges. The project based implementation allows many consultants such as architects, engineers, quantity surveyors and project managers to get involved in the industry. Actual practice allows consultants to prepare documents or drawings in the office, while progressively participating with on-site operations during construction stage. Unlike working in construction organizations, women consultants indicated their fairly balanced involvement between office and site works. The findings and implications of this study can be very useful to various parties involved in the Malaysian construction industry as well as future researchers who wish to deeply explore on the participation, barriers and challenges faced by this minority gender in the industry.

It is suggested that women consultants in the construction industry will enter the industry after graduation, but most likely leave after attaining certain age limit. This is a normal scenario, where fresh graduates feel eager to work for the attendant financial rewards and interests stimulated by knowledge gained during studies. However, various barriers such as inflexible working hours, unsuitable working conditions, family commitments and a raft of challenges such as mistreatment, strict recruitment and underrepresentation, and unfair treatment pose major obstacles for them staying in the industry. Malaysia's current economic development pursuits offer many channels for women consultants to enhance their career with flexible working hours, encouragement towards becoming self-entrepreneurial, join the academic sector or venture into firms espousing work from home programmes. Compiling knowledge gained throughout their career years in industry becomes an invaluable asset for the companies. Thus, after securing a career in the organization, consultant organizations

must continue to support the sustainability of this cohort for the benefit of the business and industry. Managing and maintaining the talent of this group should be one of the main focuses of organizations in the construction industry. This endeavor should be prioritized towards ensuring that women's involvement in the industry will increasingly and significantly improve over the coming years, given the comparatively high number of entrants at university levels.

This paper also call for various parties in the industry to include within the industry strategic plans special suggestions and initiatives on how to retain women in the industry, specifically those proven capable with good and excellent track record with family obligations, perhaps by developing flexible work schedules and work-hours and by seriously addressing issues of gender mistreatment in the working environment, especially weeding out undesirable elements of sexual chauvinism, harassment and bullying. The industry needs to be proactive and make the first move by creating a fair working environment where women are treated with due respect and fully encouraged to stay in their career track. Initiatives to work from home are good, workable options allowing opportunities for women consultants to contribute their expertise whilst at the same time able to take care of their family. However, the implementation of this programme should be done with specific performance measures agreed by both individuals and organizations.

The basic findings of the study offer some possible recommendations for future works. This research might offer more interesting findings if the respondents were interviewed to get their actual response on each barriers and challenges based on their age factor. Besides only focusing on women, perceptions from men would be an interesting point to be explored as well, for example the study on establishing women's performance and their work commitment. The comparisons between male and female perceptions would lead to comprehensive results to develop an agenda on future women's involvement in the industry. Other than that, future research could also be conducted using a more specific sample population. A limitation in this research was that the study only randomly focused on women in the construction industry and did not cover specific groups such as age, expertise and designation differences. The findings were thus able to offer only general conclusions on women consultant participation in the construction industry, as it ignored the above segmentation.

ACKNOWLEDGEMENT

The authors would like to thank the Universiti Sains Malaysia for the funding provided to conduct this research.

REFERENCES

Amaratunga, D., Haigh, R., Ginige, K., and Thurairajah, N. (2008). *Research Report on Construction Women Leaders.* Research Institute for the Built and Human Environment, University of Salford. (http://usir.salford.ac.uk/10016/1/women_in_con_bro.pdf, Retrieved on 13th April 2014)

Amaratunga, D., Haigh, R., Lee, A., Shanmugam, M., and Elvitigala, G. (2006). Construction industry and women: a review of the barriers. *Proceeding of the 3rd International SCRI Research Symposium*, Delft, Netherlands. (http://usir.salford.ac.uk/9877/1/176_

Amaratunga_RDG_et_al_CONSTRUCTION_INDUSTRY_AND_WOMEN_A_REVIEW_OF_BARRIERS_3rd_SCRI_Symposium.pdf, Retrieved on 13th April 2014)

Aulin, R., and Jingmond, M. (2011). *Issues confronting women participation in the construction* i*ndustry*. Unpublished manuscript, Division of Construction Management, Lund University, Lund, Sweden

Advances in Engineering and Technology - Contribution of Scientific Research in DevelopmentAdvances in Engineering and Technology - Contribution of Scientific Research in DevelopmentAdvances in Engineering and Technology - Contribution of Scientific Research in DevelopmentAdvances in Engineering and Technology - Contribution of Scientific Research in DevelopmentAdvances in Engineering and Technology - Contribution of Scientific Research in DevelopmentAziz, Z. A., and Marrison, A. (2001). *Status of Women Under Malaysian Laws* (http://www.wccpenang.org/files/docs/status_of_women_under_msian_laws.pdf. Retrieved 17 july 2012)

Bagilhole, B. M., Dainty, A. R., and Neale, R. H. (2002). A Woman Engineer's Experiences of Working on British Construction Sites. *International Journal of Engineering Education,* 18(4): 422-429.

Bakar, N. R. H. A. (2012). Malaysian Women in Management. *Geografia: Malaysian Journal of Society and Space,* 8(4): 12-20.

Baksh, R. (2012). Women Still Under-represented. http://guardian.co.tt/columnist/2012-06-17/women-still-under-represented. Retrieved June 17, 2012)

Bennett, J. F., Davidson, M. J., and Galeand, A. W. (1999). Women in Construction: A Comparative Investigation Into the Expectations and Experiences of Female and Male Construction Undergraduates and Employees. *Women in Management Review,* 14(7): 273-292.

Black, A. K., and Champion, R. H. (1998) Urticaria *In: Text book of Dermatology,* 6th ed. Vol. 3: Blackwell Scientific: Oxford, 2113-2139.

CITB. (2003). *Construction Skills Forecast Report.* Northen Ireland, UK. http://www.citb.co.uk/documents/research/skills_foresight_2003_tcm17-6868.pdf

Retrieved on 24th July 2012.

Clarke, L., Pedersen, E., Michielsens, E., and Susman, B. (2005). The European Construction Social Partners: Gender Equality in Theory and Practice. *European Journal of Industrial Relations, 11*(2): 151-177.

Construction Sector Council (CSC). (2010) *The State of Women in Construction in Canada*. Ottawa, Ontario. http://www.winsett.ca/GetSiteFile/StateOfWomenConstruction.pdf. Retrieved on 24th July 2012.

Dainty, A. R. J., Bagilhole, B. M., and Neale, R. H. (2000) A Grounded Theory of Women's Career Under-achievement in Large UK Construction Companies. *Construction Management and Economics,* 18(2): 239-250.

Davey, C., Wootton, A., Cooper, R., and Press, M. (2005) Design Against Crime: Extending the Reach of Crime Prevention Through Environmental Design. *Security Journal,* 18: 39-51.

Department of Statistics Malaysia (2013). *The source of Malaysia's official statistic*. Kuala Lumpur, Malaysia: http://www.statistics.gov.my/portal/index.php?lang=en. Retrieved on 5th Jun 2012.

Eaton, D., and Morton, P. (2008). A minority report: engaging girls in quantity surveying. *Proceeding of the 24th Annual ARCOM Conference,* Cardiff, UK http://www.arcom.ac.uk/-docs/proceedings/ar2008-911-920_Eaton_and_Morton.pdf. Retrieved on 5th Jun 2012.

Enshassi, A., Ihsen, S., and Al Hallaq, K. (2008) The Perception of Women Engineers in the Construction Industry in Palestine. *European Journal of Engineering Education,* 33(1): 13-20.

Fielden, S. L., Davidson, M. J., Gale, A. W., and Davey, C. L. (2010). Women in Construction: The Untapped Resource. *Construction Management & Economics,* 18(1): 113-121.

Gale, A. W. (1994). *Women in construction: an investigation into some aspects of image and knowledge as determinants of the under representation of women in construction management in the British construction industry.* Ph.D thesis, University of Bath. UK.

Geertsema, R. (2007). *Women in Professional and Leadership Positions in the Construction Industry in South Africa.* Degree Thesis*,* Tshwane University of Technology, South Africa.

Ginige, K., Amaratunga, D., and Haigh, R. (2007). Gender stereotypes: a barrier for career development of women in construction. *Proceeding of the 3rd Annual Built Environment Education Conference of the Centre for Education in the Built Environment*, University of Westminster.

Glover, J., and Fielding, J. (1997). *Gender and Science, Engineering and Technology.* Research Summary, Roechempton Institute, University of Surrey.

Greed, C. (2000). Women in the Construction Professions: Achieving critical mass. *Gender, Work & Organization, 7*(3): 181-196.

Harriet, B. (1999). *Gender and power in the workplace: analyzing the impact of economic change*. Basingstoke Hampshire: McMillan press Ltd.

Hatipkarasulu, Y., and Roff, S. E. (2011). Women in Construction: An Early Historical Perspective. *Proceedings of the Associated Schools of Construction 47th Annual International Conference*, Omaha, Nebraska. Retreive on 13th April 2014

Hoinville, G., Jowell, R., and Airey, C. (1978). *Survey research practice*. London: Heinemann Educational Books London.

Hossain, J. B., and Kusakabe, K. (2005). Sex Segregation in Construction Organizations in Bangladesh and Thailand. *Construction Management and Economics,* 23(6): 609-619.

Kaganas, F., and Murray, C. (1994). The Contest Between Culture and Gender Equality Under South Africa's Interim Constitution. *Journal of Law and Society,* 21(4): 409-433.

Kellerman, B., and Rhode, D. L. (2007). *Women and leadership: The state of play and strategies for change*. San Francisco: Jossey-Bass.

Kenya, S. D. N.-. (2010, October 9, 2013). Gender revolution in construction. http://www.standardmedia.co.ke/?articleID=2000024749&story_title=gender-revolution-in-construction&pageNo=1. Retrieved on 17th June.

Kline, P. (1999). *The handbook of psychological testing* (2th ed.). London: Routledge.

Lan, H. K. (2011). *Participation of Women as Professional in the Malaysia Construction Industry.* Degree thesis, University Technology Malaysia, Kuala lumpur.

Lauer, R.H. (1995). *Social problems and the quality of life* (VI ed.). New York: Wm.C. Brown Benchmark.

Lin, Y.-H., Chen, C.-Y., and Luo, J.-L. (2011) Statistical Analysis of Occupational Fatalities in Construction Workers. *Journal of Occupational Safety and Health,* 19: 75-85.

Li, Y., Devine, F., and Heath, A. (2008) *Equality Group Inequality in Education, Employment and Earnings: A Research Review and Analysis of Trends Over Time*. Manchester: The Equality and Human Rights Commission.

Lingard, H., and Lin, J (2004). Career, Family and Work Environment Determinants of Organizational Commitment among Women in the Australian Construction Industry,

Construction Management and Economics, 22(4):409-420
Loosemore, M., and Galea, N. (2008). Genderlect and Conflict in the Australian Construction Industry, Construction Management and Economics, 26(2):125-135
New Straits Times, (2013). *Women in the workplace,* 14th June, 2
National Women's Law Centre (NWLC) (2012). Women in Construction: 6.9 Percent is not Enough. *Employment,* Washington, DC
OSHA's Advisory Committee on Construction Safety & Health (ACCSH) (1999) *Women in the Construction Workplace: Providing Equitable Safety and Health Protection* .Health and Safety of Women in Construction (HASWIC) workgroup, Chicago.
Powell, A., Bagilhole, B. M., and Dainty, A. R. J. (2006). The Problem of Women's Assimilation into UK Engineering Cultures: Can Critical Mass Work? *Equal Opportunities International, 25*(8): 688-699.
Robinson, C. F., and Burnett, C. A. (2005) Truck Drivers and Heart Disease in the United States, 1979-1990. *American Journal of Industrial Medicine, 47*(2): 113-119.
Sarkar, M. (2002) Women in Construction. *Housing Economics, 50*(9): 6-9.
Shrum, L., and Geisler, S. (2003). Gender issues and considerations. In G.Soloman, N. Allen and P. Resta (Eds.), *Toward digital equity: The challenges of bridging the educational digital divide*. Allyn and Bacon: Longman.
Shukor, R. B. A. (2012). *Exploring The Women Foreign Labour in Construction Industry.* Degree thesis, Universiti Sains Malaysia, Penang.
Sihi, N. B. M. (2012). Exploring The Competencies of Women Quantity Surveyor. Quantity Surveying. USM, Universiti Sains Malaysia.
Sommerville, J., Kennedy, P., and Orr, L. (1993). Women in the UK Construction Industry. *Construction Management and Economics,* 11(4): 285-291.
Srivastava, A. K. (1996). *Widening access: women in construction higher education.* PhD Thesis, Leeds Metropolitan University, Leeds.
Tan, W. (2001). *Practical research methods: With applications in building and real estate*. Singapore: Prentice Hall.
The construction index. (2012). Women still under-represented in construction. Retrieved 16/05/2012, from http://www.theconstructionindex.co.uk/news/view/women-still-under-represented-in-construction
UNDP. (2003). *The Progress of Malaysian Women Since Independence 1957 - 2000*. Kuala Lumpur: Ministry of Women and Family Development.
U.S. Department of Labor (2011). Quick states on women workers, 2009 *Employment and Earnings, 2009 Annual Average and the Monthly Labor Review*, U.S. Department of Labor, Bureau of Labor Statistics, November 2009, available at: www.dol.gov/wb/stats/main.htm (Retrieve on 10 February 2011).
Wells, J. (2001). The Construction Industry in the Twenty-First Century: Its Image, Employment Prospects and Skill Requirements. Available at http://wiego.org/publications/construction-industry-twenty-first-century-its-image-employment-prospects-and-skill-req. Retrieve on 17 Jun 2012,
Williams, K. (2013). Why should women choose construction? 8 pertinent questions from a woman that did. http://constructingequality.blogspot.com/2013/01/why-should-women-choose-construction-8.html, Retrieved 4th January 2013.

MCRJ Volume 16 | No.1 | 2015

Contents

Editorial Advisory Board

Editorial

IMPULSE RESPONSE ANALYSIS FOR MALAYSIAN CONSTRUCTION SECTOR BY VECTOR ERROR CORRECTION MODEL
Raza Ali Khan, Mohd. Shahir Liew and Noor Amila Wan Abdullah Zawawi

AN EXPLORATORY STUDY ON ENABLERS AND BARRIERS FOR ONSITE MECHANISATION IN THE MALAYSIAN CONSTRUCTION INDUSTRY
M. Waris, M. Shahir Liew, M. Faris and Arazi Idrus

BUSINESS VALUE OF BIM IN MALAYSIA'S AEC INDUSTRY: PRELIMINARY FINDINGS
Mohd. Harris, Elias Ismail and Afifudin Husairi Hussain

WOMEN'S CONSULTANT PARTICIPATION IN THE MALAYSIAN CONSTRUCTION INDUSTRY
Mastura Jaafar, Azlan Raofuddin Hj Nuruddin and Norliza Mazlan

UNLEASHING THE POTENTIAL OF TRADITIONAL CONSTRUCTION TECHNIQUE IN THE DEVELOPMENT OF MODERN URBAN MASS HOUSING
Gan Hock Beng, Zuhairi Abd. Hamid and Foo Chee Hung

REVIEW OF CARBON EMISSION AND LCA APPLICATION TOWARDS SUSTAINABLE BUILDING
Murnira Othman, Ahmad Fariz Mohamed and Mahira Othman

ISSN 1985-3807

9 771985 380005